

# LIBER MATHEMATICAE: A WEB-BASED DOCUMENTATION AND COLLABORATION PROJECT FOR MATHEMATICS

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Traditionally, mathematical knowledge is published in printed media such as books or journals. With the advent of the Internet, a new method of publication became available. To date, however, most online mathematical publications do not employ the full capabilities of the medium. For example, the arXiv preprint server [1] hosts documents in Adobe's Portable Document Format (PDF), a format designed to transmit print documents between computers and maintain the formatting. Wikipedia [6], on the other hand, presents documents in-browser, but does not have support for presenting mathematics in scalable or copyable ways, since all mathematics is presented as images, not text.

The languages of the World Wide Web, namely HTML and XHTML, are derived from Standardized Generalized Markup Language (SGML), originally, and Extensible Markup Language (XML), more recently. Unfortunately, (X)HTML has no provisions for displaying mathematics, a problem which the World Wide Web Consortium (W3C) solved with the MathML markup language. Like XHTML, MathML is a markup language with "programs" stored as human-readable, plain-text files, formatted by a web browser or special viewer. As such, and as a standardized language, MathML is uniquely able to serve as a platform by which mathematics can be presented – primarily on the Web – but also processed by computer programs. In particular, computer algebra systems or tools for processing and disseminating text-based information such as search engines can handle mathematical content written in MathML. In an article in the *Notices of the AMS* from May 2005, MINER [4] explained in detail such features and the importance of MathML for the communication of mathematical content in the future.

The real power of XML technology is that it allows to transcend a current "consumer culture" within the community of mathematicians, in which a few people produce content which is then consumed by many others, and reach what FISCHER [2] calls a "culture of participation" in which knowledge is created, shared, and acted upon by all parties. This goal can be achieved by encoding mathematics in browser-readable and easily-editable documents in MathML, instead of in read-only documents like PDF.

The Liber Mathematicae project [3] looks to bring the open source model of software development to mathematics publishing by employing cutting edge XML technology, high-quality mathematics fonts for the Web from the STIX Fonts project [5] (see also [7]), and relational database technology to allow for a sophisticated version control and review process for the submitted mathematical content. We have developed a web site, where members of the mathematical community can not only view articles but can additionally participate in the creative process by contributing corrections, suggest improvements, or by expanding on the original content. In contrast to traditional mathematics journals, the main goals of Liber Mathematicae are to have articles which are expandable, correctable and dynamic, with tools for collaborative writing and open access to the entire mathematics community. Moreover due to their online nature, articles on Liber Mathematicae may contain more than static text and images and may in fact hold animations, live computational demonstrations, and so forth, and may use hyperlinking to strongly cross-reference other articles. An additional goal is to create a logical dependance tree for all mathematical theorems on Liber Mathematicae. We hope that with this new environment for communicating mathematical knowledge, the openness and cooperation will help to increase both the pace and quality of new mathematical research.

## REFERENCES

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- [4] MINER, R.: *The Importance of MathML to Mathematics Communication*, Notices of the AMS **52**, nr. 5 (2005), 532-538
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